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(54) Improvements in or relating to labelling apparatus.

(57) A reciprocating labelling device is known but it is slow and expensive. High speed labelling devices can only handle paper labels and cannot be used with plastic labels. The invention provides a high speed compact labelling device particularly adapted for use with plastic labels comprising a rotary label applying means (120) having a plurality of bellows (124) arranged at intervals therearound. The label applying means is adapted to rotate between a label receiving position and a label applying position. A vacuum is applied to the bellows to retract them except at the label applying position and labels are held on the retracted bellows by suction. At the label applying position an overpressure is applied to the bellows causing the bellows to expand into contact with an object to be labelled. Objects of irregular size can thus be labelled.

The apparatus also includes a detachable cassette (12) for a supply (16) of labels (22), the cassette including means for transporting labels (30) to the label applying means and for separating labels (32) from the label carrier (20). The cassette can be loaded and threaded up when detached from the rest of the apparatus and when loaded can replace an exhausted cassette on the apparatus without stopping the apparatus.

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IMPROVEMENTS IN OR RELATING TO LABELLING APPARATUS

This invention relates to a labelling apparatus.

British Patent Specification No.1563892 describes a labelling apparatus which separates a label from a  
5 longitudinally split carrier and then transfers the label to an article to be labelled by means which moves in a generally linear, reciprocal manner between a position in which a label is picked up and a position in which the label is applied to the article. These movements must  
10 be timed to coincide with the separation of a label from its carrier and with the presentation of an article to the labelling apparatus. The assembly which has been constructed to effect these movements is quite complicated and it requires careful engineering to  
15 relatively precise tolerances if reliable operation is to be obtained.

The aforesaid mechanism is necessarily located on the side of the apparatus which limits the minimum width thereof. This in turn limits the minimum distance  
20 between adjacent labelling apparatus in a multiple labelling device having a plurality of labelling apparatus side by side for simultaneous labelling of items such as fruit being advanced in parallel streams. The normal distance between the centres of such streams

is of the order of 130 mm which is far narrower than the minimum distance that can be obtained with the existing labelling machines arranged in side by side relationship.

5           In addition the mechanism comprises a number of parts which perform a reciprocating movement for the purposes of label advance and transfer. Reciprocating systems cannot reliably be operated at very high speeds (above 250 to 300 feet/minute). Thus such mechanism  
10 places a constraint upon the speed at which articles can be labelled by the apparatus.

          The labels for the labelling apparatus are, as stated provided on a longitudinally split carrier. The carrier is preferably wound on a bobbin from which  
15 it can be unreeled and advanced through the labelling apparatus. However, when the bobbin is emptied it can take several minutes to install a fresh bobbin and thread the carrier through the labelling apparatus. Similarly if the carrier should break or other problems  
20 develop with the labels and/or carrier the apparatus must be stopped while the broken carrier is re-threaded or other appropriate remedial action taken. During the time that the apparatus is inoperative for the above reasons, a large number of articles can pass the  
25 labelling apparatus without being labelled.

The present invention has been made from a consideration of the above-mentioned problems.

According to the invention there is provided a labelling apparatus for sequentially applying labels to  
5 objects, said apparatus comprising a label applying means, means for rotating the label applying means between a label receiving position and a label applying position, means for supplying labels to the label applying means at the label receiving position, said label applying means  
10 including label handling means adapted to receive and retain a label at the label receiving position and adapted to move outwardly from said label applying means at least at said label applying position to deposit a label on an object.

15 In a preferred embodiment of the invention labels are supplied from a label strip including first and second longitudinally arranged carrier strip portions and a plurality of labels removably adhered therealong so as to bridge the carrier strip portions. The apparatus  
20 preferably comprises a plate having first and second substantially planar surfaces and an edge lying substantially in the plane of said plate, said plate edge including first and second non-aligned edge portions, transport means for moving said label strip across one of  
25 the planar surfaces, over the edge portions whereat the carrier is separated and for moving the separated portions along different paths across the other of the planar surfaces.

Preferably the label applying means is arranged for rotation in one sense only. In other words having moved from the label receiving position to the label application position, the label applying means continues  
5 to rotate in the same sense back to the label receiving position again.

The label applying means preferably includes a plurality of label handling means arranged at regular angular intervals therearound. With such an  
10 arrangement a label can be received from the label strip at the same time as a label received somewhat earlier, is applied to an item to be labelled. It will be appreciated that such an arrangement permits labelling at very much higher speeds than with previously known  
15 devices.

For labelling of items being advanced in a plurality of parallel streams the label applying means can include  
label handling means arranged at intervals axially along the applying means, there being an associated label  
20 supply arrangement for each axial interval where label handling means is located.

Sensing means is preferably provided for noting the presence or absence of an item to be labelled. The sensing means can be used to control the supply of  
25 labels to the label applying means.

The label strip is preferably wound on a bobbin which is receivable in a housing, said housing also including the plate and the transport means and being adapted for removal from the labelling apparatus. The  
5 label strip can be supplied in other kinds of format for example fan-folded.

Specific embodiments of the invention will now be described by way of example with reference to the accompanying drawings in which:-

10 Fig.1 shows diagrammatically and in side elevation the general arrangement of a labelling apparatus;

Fig.2 is a front elevation of a part of the apparatus of Fig.1;

15 Fig.3 is a detail of part of the label strip transport means;

Fig.4 is an end elevation of the transport means of Fig.3;

20 Fig.5 shows the internal structure of the label applying means; and

Fig.6 is an under plan view of the separator plate.

Referring to the drawings the labelling apparatus, generally 10, comprises a cassette 12 having a spindle 14 on which a bobbin or reel 16 of label strip 18 is rotatably mountable. The label strip is of the kind which comprises a carrier strip 20 having labels 22 at regular intervals therealong. The outer face of each label 22 carries the appropriate information which may be printed thereon and the face adjacent the carrier is coated with contact adhesive. The carrier strip is adapted to be separated longitudinally along the centre line 24 which may be split for that purpose. The labels extend across the centre line 24. Examples of suitable label strips are described in British Patent Specification No.1563892.

The separation of the labels from the carrier strip is effected by substantially the same principles as disclosed in the above-mentioned British Patent Specification No.1563892. Thus the label strip is advanced by transport means 30 which will be described in detail later, across the underside of a separator plate 32 to a V-shaped notch 34 which defines edges 36 and 38. The separation line 24 is aligned with the apex of the notch 34 whereat the carrier is separated into two parts 20a and 20b. The carrier parts are led over the edges 36 and 38 respectively, laterally across the top of the plate 32 over outer edges 40 and 42 and then back along the underside of the plate parallel, but in the opposite direction, to the label strip 18.



As the label strip advances and the carrier is separated at the notch labels as indicated by the label referenced 44 are freed from the carrier.

Label strip 18 from the reel 16 is led around  
5 tension roller 50 and then around tape friction drum 52.  
The friction drum 52 is mounted on a shaft 54 which is  
rotatably mounted in the cassette 12. Haul-off rollers  
56, 58 are also mounted on shaft 54, one on each side of  
the friction drum 52. A tape feed gear 53 is mounted  
10 on shaft 54 between the roller 58 and the friction  
drum 52. The spacing between the rollers 56 and 58  
and the friction drum 52 preferably matches the spacing  
on the separator plate 32 between the label strip 18 and  
the separated carrier parts 20a and 20b. Each of said  
15 carrier parts is led around a separate guide roller 55  
and then to the appropriate haul-off roller 56 or 58.  
The rollers 56 and 58 are provided with small projecting  
teeth or pins 60 which make positive engagement with the  
carrier parts. Each haul-off roller 56 and 58, is  
20 provided with a pair of spring biased pressure rollers  
62, 64 which urge each carrier part into contact with  
the haul-off roller over which it is led. The carrier  
parts finally drop under gravity into a waste receiver 66.  
Other arrangements can be made for disposal of the waste  
25 carrier parts. For example the carrier waste can be  
drawn away through a vacuum tube and chopped by suitable  
means such as a rotary cutter.

Tension in the label strip is maintained by a pressure plate 70 which bears upon the strip as it passes along the underside of the separator plate. A pair of bolts 72 (only one of which is visible in Fig.5) extend through the plate 32 and are engaged in the plate 70. The spacing between bolts 72 is sufficient to permit the label strip to pass therebetween. A compression spring 74 surrounds each bolt 72 between the plate 32 and the head of the bolt so that the bolts are urged upwardly and hence the plate 70 is urged towards the underside of plate 32.

The plate 32 is pivotally mounted at the end 80 thereof adjacent the tape friction drum 52. A crank 82 pivotally mounted at 84 below plate 32 has one arm 85 provided with a roller 86 which engages the underside of plate 32. The other arm 87 of crank 82 has a cam follower roller 88 which engages a cam 90. A spring 91 in a housing 93 fixed to the cassette 12 is arranged to bear on the upper surface of plate 32 to urge it downwardly.

The cam 90 has a profiled surface which is repeated twice around the periphery. In other words the cam is designed to produce the same sequence of movements in the cam follower for every half revolution thereof. The cam 90 is fixed to the output hub 93 of solenoid actuated two stop wrap spring clutch 94.

A pawl 101 rotatably mounted on shaft 98 has one end 102, urged by spring 103 into engagement with a toothed collar 104 of a wrap spring clutch 96 mounted on drive shaft 106. The other end 105 of the pawl 101  
5 engages one or other of two latch rollers 107 on the cam 90. A drive pulley 108 also fixed to clutch 96 is connected by an endless belt 109 to a pulley 110 on driven shaft 112. A gear 114 is also provided on shaft 112 for driving engagement with the tape feed gear 53.  
10 It will be understood that gear trains may replace the arrangements of pulleys and belts.

The shafts 106 and 92 are driven by means (not shown) such as an electric motor or the drive for conveyor 154 which carries the items to be labelled.

15 Label applying means 120 comprises a body 121 having a plurality of faces 122, six in the illustrated embodiment and having an internal bore 123 of circular cross-section lined by a bush 125. A bellows 124 is fixed to each face by suitable means so as to surround a  
20 hollow projecting boss 126. A passageway 128 extends from each boss through the body 121 and through bush 125.

A tube 132 is mounted in the bush 125 so that the body 121 and bush 125 can rotate relative thereto. A second tube 135 is disposed within tube 132 thereby

defining an annular space 130 between tubes 132 and 135. Bores 134 are formed in tube 132 whereby the passageways 128 can be brought into communication with space 130 as the body rotates.

5           A passageway 136 extends from the interior 138 of the tube 135 to the surface of the bore 123, there being no communication between the interior space 138 and the space 130.

10           The body 121 is mounted for rotation just below the separator plate 32 at the end thereof where labels are separated from the carrier. Rotation of the body is effected by an endless belt 140 which extends around a pulley 142 on the body and a pulley 144 on drive shaft 92. An air pump (not shown) is arranged to  
15 deliver air through inlet 150 into the interior space 138 and at the same time to evacuate from outlet 152 the air in the space 130.

20           The free end of each bellows is provided with a valve which permits air to be drawn into the bellows but which substantially closes when the air pressure within the bellows is greater than the external pressure. The particular kind of valve employed is a matter of choice.

25           As illustrated diagrammatically in Fig.1 conveyor 154 for articles 156 to be labelled is arranged to move

past the labelling apparatus below the label applying means 120. The conveyor is arranged to move the articles 156 at substantially equispaced intervals. Upstream of the label applying means an optical, or  
5 other suitable, article sensing device 158 is provided which produces a signal when an article 156 moves therepast. The sensing device is mounted in a head 162 and is connected to an electronic timing system which triggers operation of the solenoid operated wrap  
10 spring clutch 94.

The labelling apparatus operates as follows:-  
Assume that the conveyor is advancing in the direction of arrow 166 and the label applying means is continuously rotated. When an article which is designated X is  
15 sensed by the device 158 the solenoid operated wrap spring clutch 94 is energized so that the output hub 92 and cam 90 rotate one half revolution. Cam roller 107 lifts arm 105 which causes pawl 101 to be rotated, anticlockwise thus releasing end 102 from clutch collar  
20 104. Clutch 96 is thus engaged to drive via the tape feed gear 53 in anticlockwise rotation through pulley 108 belt 109, pulley 110, shaft 112 and wheel 114. The movement of the gear 53 causes shaft 54 to rotate also and therewith the haul-off rollers 56 and 58. The label  
25 strip from the reel is thus advanced over the separator plate and a label removed therefrom as explained earlier.

Spring 103 returns pawl 102 into engagement with clutch collar 104 to prevent further advance of the label strip.

A very short time, (for example 5 milliseconds)  
5 after cam roller 107 has moved cam arm 105 to initiate label supply, the profile on cam 90 has rotated to permit clockwise rotation of crank 82 about 84 so that plate 32 drops downwardly under the action of spring 91 and places label in contact with a bellows on the label  
10 applying means. It will be appreciated from the foregoing that by slightly delaying the movement of the separator plate the label presented to the label applying means will be moving at the time that it contacts a bellows. Preferably the speed of movement of the  
15 label at the moment of contact with a bellows should not be less than the linear speed of the bellows.

These movements are also adjusted to take place so that plate 32 is lowered when the label applying means has rotated to bring a bellows 124 into position  
20 therebeneath. With a label apparatus as illustrated with six bellows around the body 120 the aforesaid rotation of the label applying means is through 60°. At the same time a label is separated from the carrier and is, therefore, held by suction onto the free end of  
25 the bellows because of the reduced pressure therein

which exists by virtue of the communication of the bellows through passage 128 with the space 130.

As successive articles 156 on the conveyor are sensed by device 158 the above sequence of movements is repeated. At the third cycle the article X has now arrived below the label applying means and in register with the bellows that picked up a label as a result of the movements set in train by the sensing of that particular article. As can be seen in Fig.5 the passageway 128 in the lowermost position connects the bellows through passageway 136 to the space 138. The bellows, therefore, in that position is expanded by the air pressure and the label carried by the bellows is pressed onto the article. The provision of a flexible bellows enables the labels to be applied to articles of different size and shape and to articles which may be rolling or rotating during their linear advance past the labelling apparatus. Further rotation of the body 121 causes the passageway 128 of the expanded bellows to be reconnected through an aperture 134 of the space 130 so that the bellows collapses.

It will be appreciated that the position of the sensing device 158 is chosen with regard to the number of steps that the label applying means takes between receiving a label at the separator plate and arriving at the position where the label is to be

applied to an article. In addition the speed of the conveyor and the movement of the labelling apparatus must be matched.

It will be apparent from the foregoing description  
5 that if no article is sensed by the sensing device 158  
the solenoid 159 is not actuated and the cycle of operations is not initiated. The plate 32 remains in its upper position and no label is received by the label applying means.

10 The embodiment just described can be constructed with an overall width of the order of 100 mm. A compact multiple labelling machine for labelling parallel streams of articles can be made by disposing a plurality of labelling apparatus in side by side  
15 relationship as illustrated in Fig.2 with a common drive means. The bellows 124 for the plurality of labelling apparatus are preferably all disposed on a single body.

A further advantage of the embodiment just  
20 described is that the cassette 12 together with the tape transport means 30 and the plate 32 can be adapted for removal from the labelling apparatus. Thus when the reel 16 is exhausted the cassette can be removed and replaced with a fresh cassette with a  
25 full reel 16 already threaded up. This change can be



effected very quickly without stopping the apparatus.

At worst only a few articles will pass during the cassette change without being labelled.

Provision may also be made for adjusting the  
5 length of tape indexed in a cycle of operation as may  
be necessary for different sizes of label. If a large  
label is to be applied the tape must be advanced in each  
cycle through a greater distance than for a smaller label.

Although in the embodiment just described, bellows  
10 are provided for carrying labels from the separator  
plate to the objects to be labelled, other provision can  
be made which will produce the same result. For example  
instead of bellows cylinders preferably of lightweight  
material such as plastics can be provided which  
15 reciprocate in appropriate bushings in the label  
applying means 120 in response to vacuum and pressure as  
with the bellows. In other words the cylinders are  
retracted by means of the vacuum except at the label  
applying position where they are moved outwardly from  
20 the label applying means to deposit a label on an object.

CLAIMS

1. A labelling apparatus for sequentially applying labels to objects, said apparatus comprising a label applying means, means for rotating the label applying means between a label receiving position and a label applying position, means for supplying labels to the label applying means at the label receiving position, said label applying means including label handling means adapted to receive and retain a label at the label receiving position and adapted to move outwardly from said label applying means at least at said label applying position to deposit a label on an object.

2. A labelling apparatus as claimed in Claim 1, and comprising labels supplied from a label strip including first and second longitudinally arranged carrier strip portions and a plurality of labels removably adhered therealong so as to bridge the carrier strip portions and a plate having first and second substantially planar surfaces and an edge lying substantially in the plane of said plate, said plate edge including first and second non-aligned edge portions, transport means for moving said label strip across one of the planar surfaces, over the edge portions whereat the carrier is separated and for moving the separated portions along different paths across the other of the planar surfaces.

3. A labelling apparatus as claimed in Claim 1 or Claim 2 wherein the label applying means is adapted for rotation in one sense only.
4. A labelling apparatus as claimed in any preceding claim wherein a plurality of label handling means are provided.
5. A labelling apparatus as claimed in any preceding claim, wherein sensing means is provided for noting the presence of an object to be labelled.
- 10 6. A labelling apparatus as claimed in Claim 5, wherein the sensing means is adapted to control delivery of labels to the label applying means.
7. A labelling apparatus as claimed in Claim 5, or Claim 6, wherein the sensing means is adapted to control movement of the label applying means.
- 15 8. A labelling apparatus as claimed in any preceding claim wherein the supply of labels is stored in a housing.
9. A labelling apparatus as claimed in Claim 8, wherein the housing and the means for supplying labels to the label applying means are detachable from the rest of the apparatus.
- 20

10. A labelling apparatus as claimed in Claim 9,  
wherein the housing and means for supplying labels form a unit  
which can be loaded with label strip when detached from  
the rest of the apparatus and wherein a loaded unit can  
5 be substituted for an empty unit on the apparatus without  
stopping the apparatus.

11. A labelling apparatus as claimed in any preceding  
claim, wherein the label handling means comprises a  
bellows mounted on the label applying means.

10 12. A labelling apparatus as claimed in Claim 11,  
wherein the label handling means includes means for  
retracting the bellows in the label receiving position  
and for expanding the bellows in the label applying  
position.

15 13. A labelling apparatus as claimed in any preceding  
claim, wherein the label handling means is connectable  
at the label receiving position to means for reducing  
the pressure therewithin.

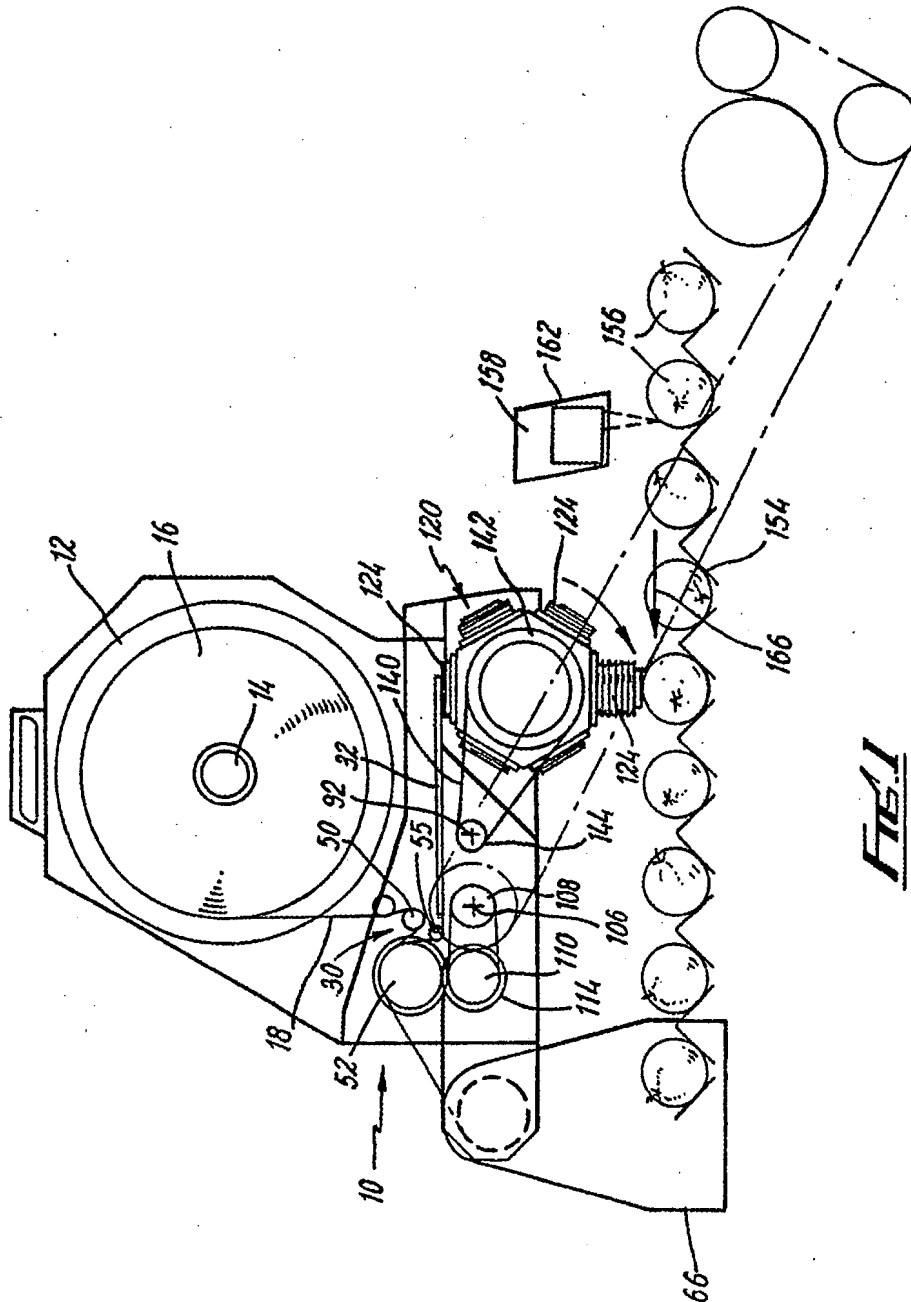
20 14. A labelling apparatus as claimed in any preceding  
claim wherein the label handling means is connectable,  
at the label receiving position and between the label  
receiving position and the label applying position, to  
means for reducing the pressure therewithin.

15. A labelling apparatus as claimed in any preceding claim wherein the label handling means is connectable, at the label applying position to means for increasing the pressure therewithin.
- 5 16. A labelling apparatus as claimed in Claims 14 and 15, wherein communicating means is provided between the interior and the exterior of the label handling means whereby a label presented to the communicating means on said label handling means at the label  
10 receiving position is held thereon by the underpressure therein and whereby at the label applying position the bellows is extended by the overpressure therein and said label is applied to the object to be labelled.
- 15 17. A labelling apparatus as claimed in any preceding claim, comprising a plurality of label applying means.
18. A labelling apparatus as claimed in Claim 17 wherein each label applying means is provided with a separate means for supplying labels thereto.
- 20 19. A labelling apparatus substantially as described herein with reference to Figs.1, 3, 4, 5 and 6 or Figs.1 to 6 of the accompanying drawings.

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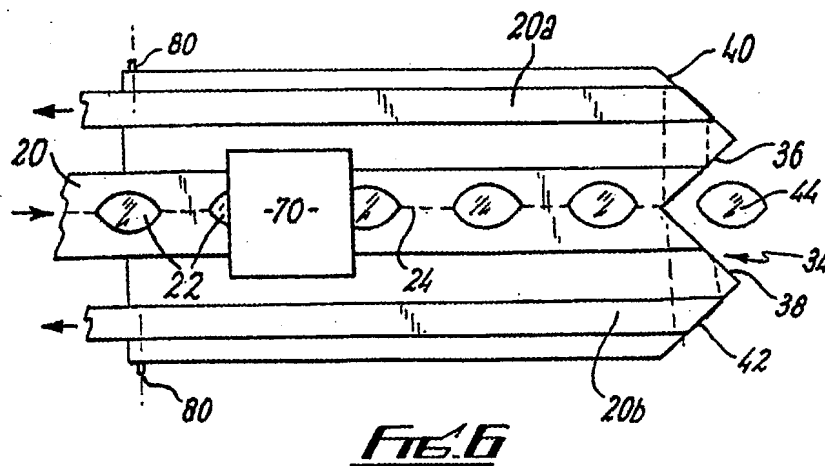
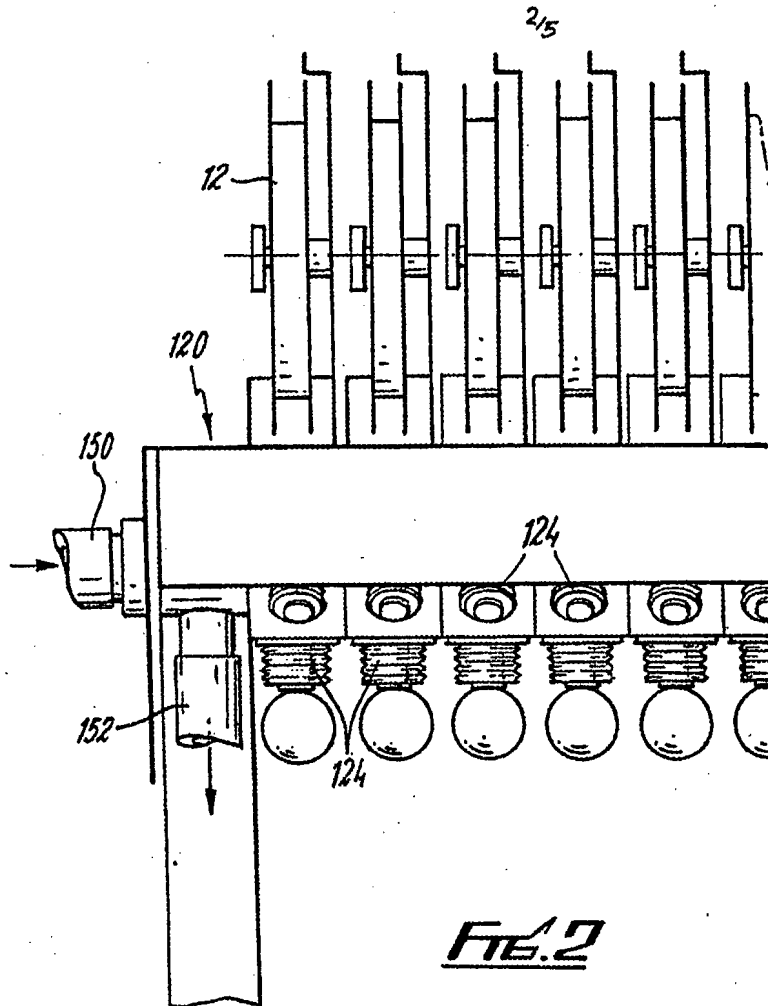
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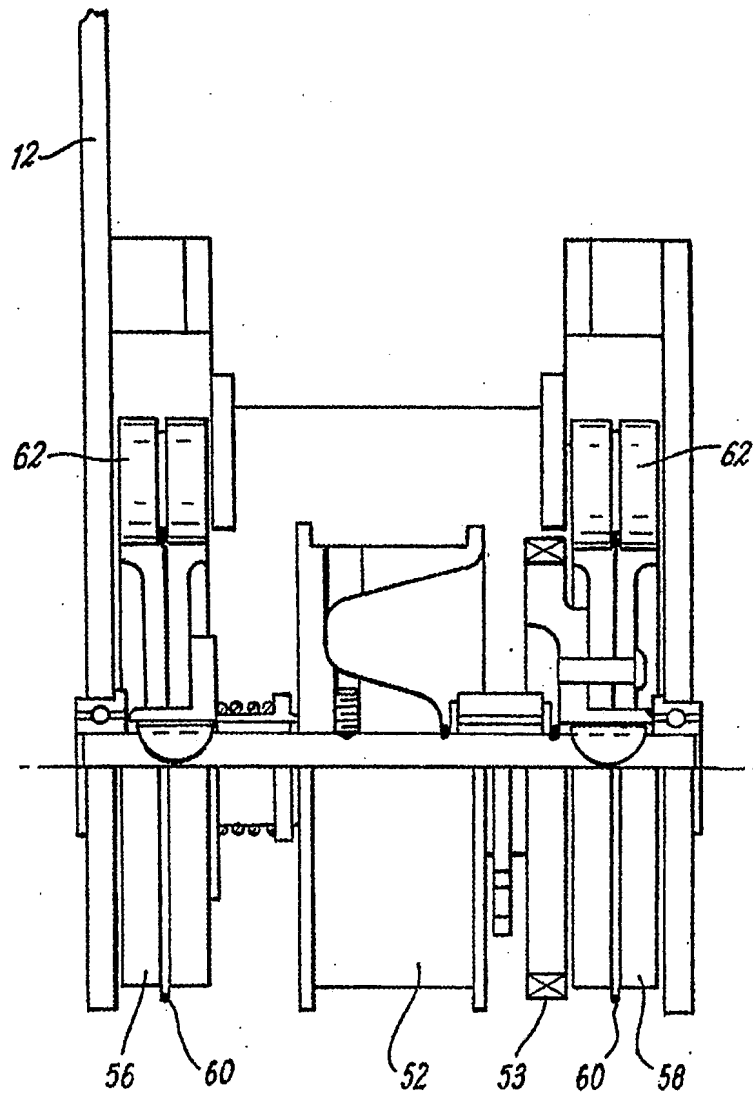
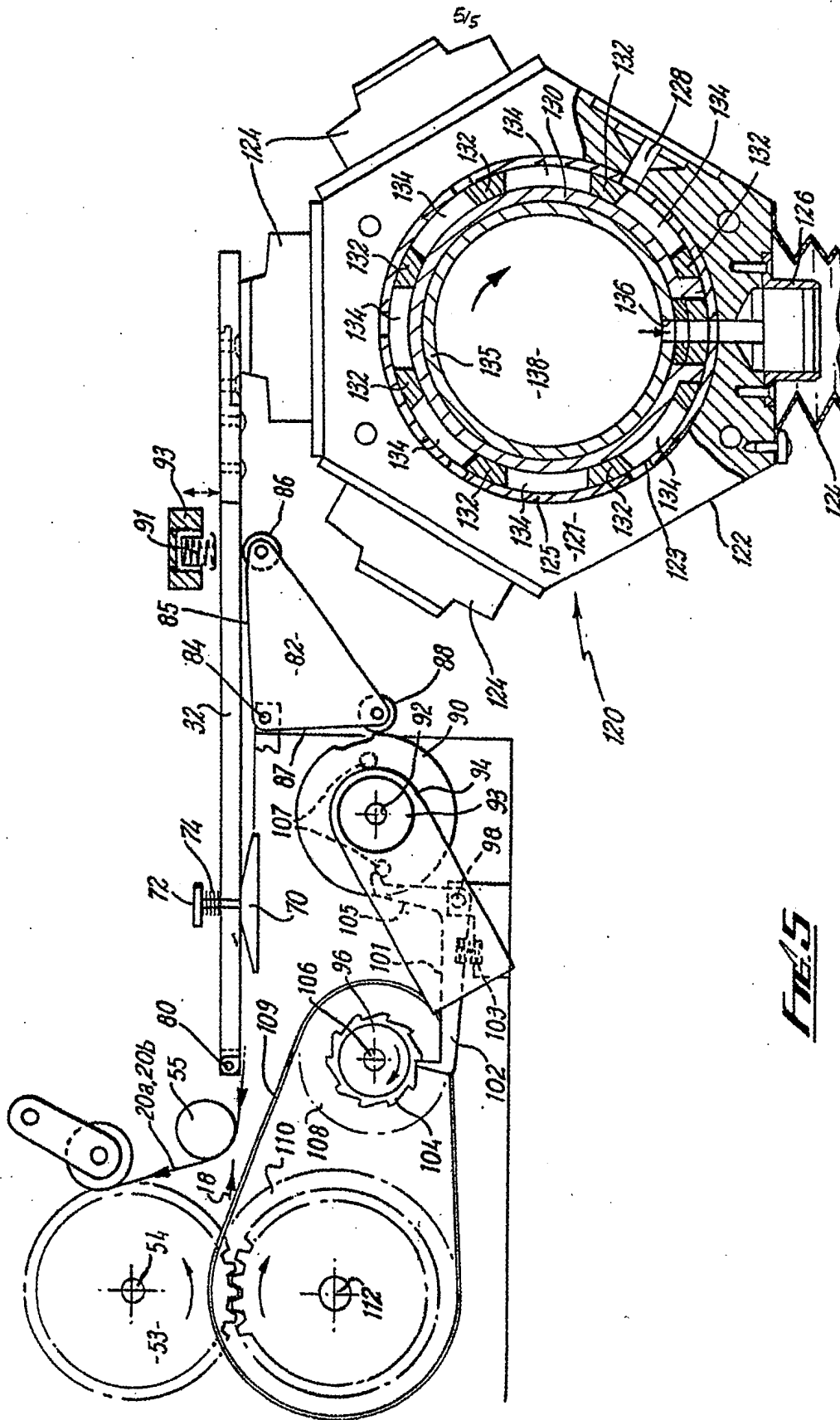


FIG. 4

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**FIG. 5**